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INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

U.S. EPA and Environmental Council of States

Partners for Meeting State Research Needs

The U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD) has partnered with the Environmental Council of States (ECOS, the national association of state environmental agency leaders) and its research arm, the Environmental Research Institute of the States (ERIS), to ensure that its research is useful and practical for the states--and has impact.

Together, ERIS and ORD have worked over the past five years through a series of meetings and surveys to align EPA scientific and technical capabilities with state research priorities and needs.

States identified needs grouped into broad topics such as drinking water, water pollution, hazardous waste, air and energy. ORD scientists then used state input to help make our tools, methods, models and research useful and practical for the states.

The following are some examples of how EPA resources have helped states meet their environmental challenges and responsibilities.

Partner: Iowa Department of Natural Resources
Challenge: High ammonia levels in drinking water
Resource: Innovative Small Drinking Water Systems Treatment

To help water utilities reduce high ammonia levels in drinking water, a collaborative team from the Iowa Department of Natural Resources, EPA Region 7 (Midwest) and EPA ORD conducted a pilot study to evaluate the impact of biological water treatment on ammonia oxidation in a small Iowa community.

The study used a biological water treatment technology for ammonia oxidation developed and patented by EPA researchers, and the pilot system was designed, built, and installed by EPA staff. Tests demonstrated the system's ability to effectively remove ammonia and iron from the community's source water. A full-scale water treatment plant was completed in January 2014 based on the successful pilot system.



"Ammonia residual in the distribution system can cause nitrification and other operational 'nightmares,'" said Iowa Department of Natural Resources Division Administrator Bill Ehm. "This EPA ORD supported pilot project in Palo is successful and the use of biologically active filters is an innovative, emerging drinking water technology that can be a viable option for certain other systems."

Partner: City of Kansas City, MO

Challenge: Reduce sewer overflows and improve regional water quality

Resource: Innovative green infrastructure solutions and tools



States and municipalities heavily use ORD's Storm Water Management Model (SWMM) and are beginning to use ORD's National Stormwater Calculator to model stormwater flows and the performance of water infrastructure in urban areas. Both have a Climate Adjustment Tool to predict the change in temperature and precipitation that will influence the runoff volumes. SWMM is the engine for the basis of almost all consent decree and other future water infrastructure design. SWMM runoff and flow predictions are used for multi-billion dollar decisions for foreign, federal, state and municipal governments.

The city of Kansas City, MO designed its \$10 million, 100-acre Middle Blue River pilot on XPSWMM predictions and, based on its performance, the City will design its \$2 billion, 20-year consent decree. "States are focusing on ways to address storm water and tools like the Storm Water Management Model are essential to a successful outcome," said Sara Parker Pauley, director of the Missouri Department of Natural Resources. "This model makes analyses of best management practice options readily available. In addition, the climate adjustment addition helps cities reach sustainable solutions."

Partner: Minnesota Pollution Control Agency

Challenge: Development of an updated sulfate standard

Resource: Technical support to the State by expert consultation and peer review

EPA scientists supported an ongoing effort in Minnesota to better understand and address the effects of sulfate and other substances on wild rice, an important component of many Minnesota lake and stream ecosystems, and a highly valuable economic and cultural resource for many state residents. Agency researchers consulted with lead scientists from the Minnesota Pollution Control Agency (MPCA) on both the original study protocol and the technical aspects of the study, and then on the analysis and interpretation of the resulting data. They have also consulted with EPA Region 5 on aspects of sulfate water quality standards.

As noted by MPCA Commissioner John Stine, "The MPCA values the scientific expertise and partnership of EPA-ORD, as we have worked to understand the complex physical, chemical and biological relationships that impact wild rice growth in Minnesota's lakes, stream and wetlands. By cooperating with the EPA ORD's Mid-Continent Ecology Division and other scientific experts, MPCA has developed ground-breaking improvements in our understanding of these relationships."



Partner: Nevada Department of Conservation and Natural Resources, EPA STAR grantee

Challenge: Mercury emissions from precious metal mines

Resource: EPA STAR program funded research grant



In 1998, the Toxic Release Inventory (TRI) was changed to require the mining industry to report its mercury emissions. Through this revised federal reporting mechanism, Nevada mines were found to be a very large source of mercury emissions. Mercury from natural and anthropogenic sources that enters oceans, lakes and rivers is converted to methyl mercury by aquatic organisms and bioaccumulates in fish and shellfish.

Research by scientists at the University of Nevada, Reno funded by the EPA Science To Achieve Results (STAR) grants program provided critical information to the Nevada Department of Conservation & Natural Resources on understanding the role of natural sources in the atmospheric cycling of mercury and on quantifying mercury emissions from geologic sources. This research helped lay the foundation for the Nevada Mercury Control Program (NMCP). "The beauty of the grant was that our Division of Environmental Protection was able to, in real time, meld the research into a state of the art regulatory program, the first of its

kind in the nation, in less than two years," said Leo Drozdoff, Director of the Nevada Department of Conservation and Natural Resources.

Partner: State of Ohio

Challenge: Harmful algal bloom

Resource: Innovative Drinking Water Testing

In early August 2014, residents in and around Toledo, Ohio awoke to an emergency "Do Not Drink" water advisory from their local water utility, due to cyanobacterial toxins detected in their treated drinking water. Cyanobacteria, also known as blue-green algae, are particularly tricky because toxins are released from the bacteria when they are damaged, so boiling the water only makes the situation worse.

The City uses Lake Erie as their drinking water source, which, at the time, was experiencing a large cyanobacteria harmful algal bloom. Officials with the State of Ohio immediately reached out to EPA's Cincinnati-based research laboratory—a world leader in the evaluation and development of innovative drinking water testing, monitoring, and treatment technologies—for technical assistance. That help, combined with that of other partners, allowed the City of Toledo to lift the advisory within a little more than two days, restoring safe drinking water to some half a million people. Ohio has long enjoyed a strong relationship with EPA ORD. "When we were faced with an emergency in Toledo last August due to cyanobacterial toxins detected in their treated drinking water, ORD staff was a great partner and exceeded our expectations in understanding science and helping optimize treatment and restore safe drinking water to our residents," said Ohio EPA Director Craig Butler.



Partner: Oklahoma Department of Environmental Quality

Challenge: Fish Kills and Unknown Contamination

Resource: Chemical Composition Analysis



Agency scientists assisted the Oklahoma Department of Environmental Quality and EPA Region 6 (South Central U.S.) in identifying unknown contaminants that were present during four fish kills in the Red River watershed. Using state-of-the-art analytical tools, the conditional chemical assignments of the contaminants were determined.

In September 2012, EPA partners from the Office of Research and Development provided assistance to determine the source of stray gases bubbling in the Red Creek and Red River, overseeing analysis (conducted by a private company) of the chemical composition and isotope analysis that ultimately determined that the stray gases were from a biogenic source.

"The ORD National Exposure Research Laboratory-Environmental Sciences Division, Las Vegas was a valuable asset during Oklahoma DEQ's investigation into the Red River fish kills," said Executive Director Scott Thompson. "This facility's expertise and analytical technologies assisted with researching potential causative agents related to these fish kills. In addition, I strongly support the mission of ORD to conduct valuable research that leads to improvements in the continued protection of public health and the environment."

Partner: Pennsylvania Department of Environmental Protection

Challenge: Wide-spread freshwater fish disease

Resource: The Causal Analysis/Diagnosis Decision Information System (CADDIS)

Unusual mortality events and outbreaks of disease have been observed annually in young-of-year Smallmouth Bass in the Susquehanna River Basin since 2005. The Susquehanna River Smallmouth Bass Technical Committee, including representatives from the Pennsylvania Department of Environmental Protection (PADEP) and the Pennsylvania Fish and Boat Commission (PFBC) was formed in 2007 to characterize the potential causes of these outbreaks. Numerous water-quality and fish health variables were evaluated, but no definitive associations emerged. Additional research and monitoring efforts have continued and in 2012 the PADEP initiated a large study of the river. Coordinating the analyses of all of these data has been a challenge.



PADEP and its partners looked to EPA ORD's expertise and innovative tool, the Causal Analysis/Diagnosis Decision Information System (CADDIS), to help organize and synthesize the data. EPA assisted PADEP and its partners in implementing the CADDIS causal assessment process, providing a means to utilize the study data collected to date; winnow the long list of hypothesized causes of the Smallmouth Bass health issue; and optimize further data collection and analysis efforts. "I am confident that our science-based partnership with EPA's Office of Research and Development and the Pennsylvania Fish and Boat Commission will help us determine the causes of impacts to aquatic health in the Susquehanna. Science guides our work in assessing the overall health of the river, and in partnership with these agencies, we will be able to create a strategy that matches our challenges to conserve and protect this river, which is important to the recreational vitality and economic prosperity of Pennsylvania," said PADEP Secretary John Quigley.